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ABSTRACT

As part of an update of studies for predicting fall semester grade point averages (GPA) of freshmen at Indiana University, 4,260 freshmen entering the Bloomington campus in the fall of 1980 were assessed. Scholastic Aptitude Test (SAT) scores and/or relative high school rank (RHSR) were used to predict first semester GPAs. Three sets of equations for predicting GPAs and a graphic scheme are presented. In terms of academic achievement, females were slightly more predictable than the males. The standard error of estimate and the multiple correlations indicate the difference in predictability. The most important single predictor of GPA for males and for females was RHSR. By using the graphs and statistical data, an advisor may estimate the probabilities of a student obtaining GPAs in various ranges. Local normative data on SATV, SATM, SATSUM, RHSR, and first semester GPA are included. For the 1980 entering freshmen, males and females were equal on SATV, but the males averages 45 points higher than females on SATM. The average entering female ranked 6 percent higher in her high school graduation class and obtained a higher first semester GPA than average entering male. (SW)

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GPA PREDICTION PROCEDURES AND NORMATIVE DATA FOR FRESHMEN

Clinton I. Chase

INDIANA STUDIES IN HIGHER EDUCATION
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Abstract

The 4,260 freshmen who entered the Bloomington campus of Indiana University in the Fall of 1980 were used to establish two schemes for predicting first semester grade point averages. Three sets of prediction equations and a graphic scheme for determining probable grade point averages were provided. Entering freshmen norms were included for SAT scores, high school rank, and first semester college grade point averages.

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Introduction

When freshmen arrive on a university campus, their advisers have little idea as to what kind of academic performance these students will produce. The purpose of these periodic publications is to aid advisers in predicting academic performance for their advisees, and to provide normative data for evaluating student data. Following the traditional procedures in predicting grade point averages, the scores on the College Entrance Examination Board's Scholastic Aptitude Test (SAT) and a measure of high school achievement, relative high school rank in the graduation class (RHSR), were employed as predictor variables. The primary purpose of these publications was to provide information for advising prospective students concerning the probability of success in the college curriculum at I.U.B.

Because of the changing characteristics of student populations, grading systems, and the relationships among predictor variables, the procedure has been updated about every three years. This monograph is the 7th in the series of updates based on the admissions data and first semester grades of 4,260 freshmen who entered the Bloomington campus in the Fall of 1980.

This monograph provides two procedures for predicting semester grades. In addition, normative information on SAT scores, RHSR, and GPAs obtained by freshmen during their first semester at I.U.B. is provided. This publication is primarily developed for professional use by high school and college admission counselors, and the academic advisors, faculty and administrators of Indiana University.

The Data Base

All students who apply for admissions to Indiana University-Bloomington are required to take the Scholastic Aptitude Test (SAT). The two scores obtained on this test are measures of verbal aptitude (SATV) and mathematical aptitude (SATM). Each of these measures is reported on a scale of 200 to 800. The two scores on the SAT may be summed to yield a total score (SATSUM) which ranges from 400 to 1600.

A second measure used in the prediction of first semester GPAs is one of previous academic success, relative high school rank (RHSR). RHSR incorporates an adjustment for the variation in the size of high schools that entering freshmen attended. To obtain RHSR, a student's rank in the high school graduation class (HSR) is divided by the size of the high school graduation class (HSS). The resulting proportion is multiplied by 100 and rounded to a whole number. The formula for relative high school rank is $\text{RHSR} = \frac{\text{HSR}}{\text{HSS}} \times 100.$

Thus, a RHRS of 21 indicates that a student was ranked in the top 21 percent of his/her graduation class.

The criterion for the prediction procedure is first semester grade points (GPA). It is reported on a four-point scale where A=4.00, B=3.00, C=2.00, D=1.00, and F=0.00.

Equations for Predicting Grade Point Averages

Three equations are provided in Table 1 for predicting first semester GPAs of females and males. In these equations SATs and/or RHSR are combined for the optimum accuracy in predicting a student's GPA. The equations may be used by admissions officers in identifying and admitting those applicants who are most likely to succeed in the college curriculum at I.U.B.

The first set of equations in Table 1 provides the best prediction of first semester grades, combining the information on SATs and RHSR. However, some applicants do not provide both SATs and high school data. Therefore, the second set of equations can be applied in the case where an applicant has provided only their SAT scores. The last set of equations are applicable when only the high school data is available for a prospective student. To determine the predicted grade point average (PGPA), substitute a student's SATs and/or RHSR into the appropriate equation.

The standard error of estimate (Sest) for each equation is also provided in Table 1. The Sest is provided to indicate the degree of error/accuracy in the predictions. Approximately sixty-eight percent of all students can be expected to obtain a GPA within plus-and-minus one Sest of their predicted GPA.

Descriptive statistics for the measures in the prediction equations are provided in Table 2. *Only students who had information on all measures were used in obtaining the prediction equations and the descriptive statistics.* For each possible predictor variable (SATV, SATM, SATSUM, RHSR), the correlation coefficient and the percentage of GPA variance indicate the degree that a variable is associated with academic achievement in college (GPA). The multiple correlations of SATV, SATM and RHSR are included in Table 2.

Table 1

Three Equations for Predicting First Semester Grades at Indiana University-Bloomington

GROUP	EQUATION	S_{est}
	Prediction with Relative Rank (RHSR) and SATs	
Female	PGPA=1.691294-0.012359 RHSR+0.001317 SATV+0.001536 SATM	.59
Male	PGPA=2.040472-0.013269 RHSR+0.000647 SATV+0.001348 SATM	.66
	Prediction with SATs only	
Female	PGPA=0.900127+0.001579 SATV+0.002388 SATM	.62
Male	PGPA=0.963980+0.001201 SATV+0.002229 SATM	.70
	Prediction with Relative Rank only	
Female	PGPA=3.189795-0.019618 RHSR	.63
Male	PGPA=3.174386-0.017981 RHSR	.68

Table 2

Descriptive Statistics on Entering Freshmen
in Fall 1980 at Indiana University-Bloomington

Group	Variable	Mean	Standard Deviation	Correlation(r) with GPA	% of GPA Variance(r^2)
Females (N=2120)	SAT Verbal	457	94.1	0.41	17
	SAT Mathematics	481	94.4	0.45	20
	SATSUM	939	168.5	0.48	23
	RHSR	21.0	16.0	-0.45	20
	GPA	2.76	0.74	--	--
	Combination of SATV, SATM and RHSR			0.54	29
Males (N=1719)	SAT Verbal	463	87.9	0.29	8
	SAT Mathematics	526	95.8	0.36	13
	SATSUM	989	160.6	0.37	14
	RHSR	26.7	18.3	-0.43	18
	GPA	2.66	0.79	--	--
	Combination of SATV, SATM and RHSR			0.47	22

Graphs for Predicting Grade Point Averages by Hand

The present section provides an alternative procedure for estimating a student's likely achievement at Indiana University. The most useful interpretation of predicted grade point average (PGPA) is in terms of a range of GPAs which the student is most likely to obtain during his/her first semester at I.U. The following procedure provides an advisor with a quick method of obtaining the probabilities of a student achieving in the different GPA ranges provided. The advisor who uses this procedure does not need to employ the equations in Table 1 to obtain the probability of success for a prospective or new student.

There are five steps in determining for a student the probabilities of achieving the various GPA categories during his/her first semester.

Step 1: Select the appropriate figure corresponding to the student's sex, Figure 1 for males or Figure 2 for females. Two measures, SATSUM and the measure of high school rank (RHSR) are used to enter the figures.

Step 2: SATSUM (i.e., SATV+SATM) is located on the horizontal axis of the figure and ranges from 400 to 1600. Move along the horizontal axis to the point that most closely corresponds to the student's SATSUM.

Step 3: Compute the student's RHSR expressed on a decile scale (DHSR) which ranges from 1 to 10. Using a student's high school rank (HSR) and high school size (HSS), DHSR is equal to HSR divided by HSS multiplied by 10 (round the resulting value). Move down the vertical axis to the point that most closely corresponds to a student's DHSR.

Step 4: Locate the point on the figure where these two values (SATSUM and DHSR) intersect. This point will be in one of the four probability letter groups -- Q, R, S, or T. Determine the Student's probability letter group. Consider both probability letter groups for borderline cases.

Step 5: Now take this letter to Table 3 to obtain the probabilities for the various GPA categories. Locate the column for the student's probability letter group (Q,R,S,T) in the table. Under the column label for the appropriate sex, read the probabilities for each GPA category.

Example

Shirley has a SATSUM of 950 (SATV=520 and SATM=430) and a DHSR of 3.2. Figure 2 places Shirley in category S. Referring to the column labeled S for females in Table 3, we find that 1.2 percent of females like Shirley obtained GPAs below 1.00, 10.0 percent obtained GPAs between 1.00 and 1.99, 56.6 percent between 2.00 and 2.99, and 32.3 percent between 3.00 and 4.00. In the second part of Table 3 we find that 88.9 percent of the females like Shirley obtained a first semester GPA of 2.00 or higher.

Table 3

Percent of Students in Each Letter Category (Q, R, S, or T) According to GPA's Obtained during their First Semester at Indiana University-Bloomington

Obtained First Semester GPA	Predicted First Semester GPA Category							
	Q		R		S		T	
	Males	Females	Males	Females	Males	Females	Males	Females
3.00-4.00	5.0	2.7	16.7	13.3	34.7	32.3	70.6	72.8
2.00-2.99	72.5	59.5	54.0	59.7	52.3	56.6	25.2	25.3
1.00-1.99	20.0	32.4	22.7	22.9	11.7	10.0	3.9	1.5
0.00-0.99	2.5	5.4	6.6	4.2	1.3	1.2	.3	.3
2.00 and above	77.5	62.2	70.7	73.0	87.0	88.9	95.8	98.1
Below 2.00	22.5	37.8	29.3	27.1	13.0	11.2	4.2	1.8

If assistance is needed in the use of the prediction procedure, or in the interpretation of the predicted grade point average, please call the Bureau of Evaluative Studies and Testing (Phone: 812/337-1595).

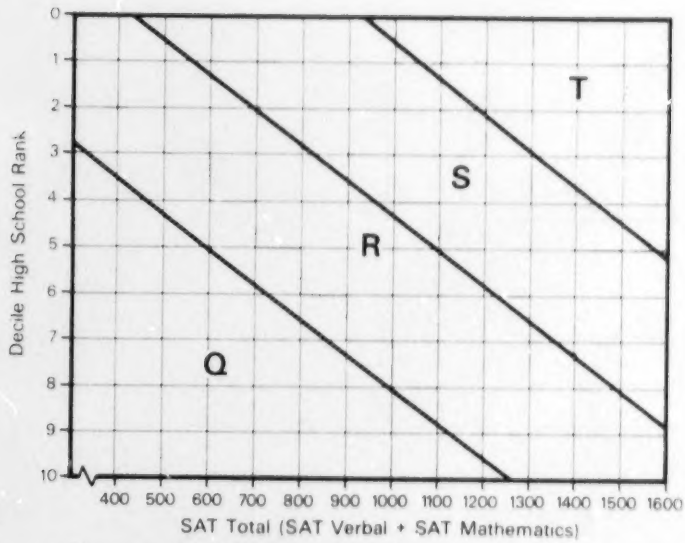

Figure 1. Predicted achievement categories for males.

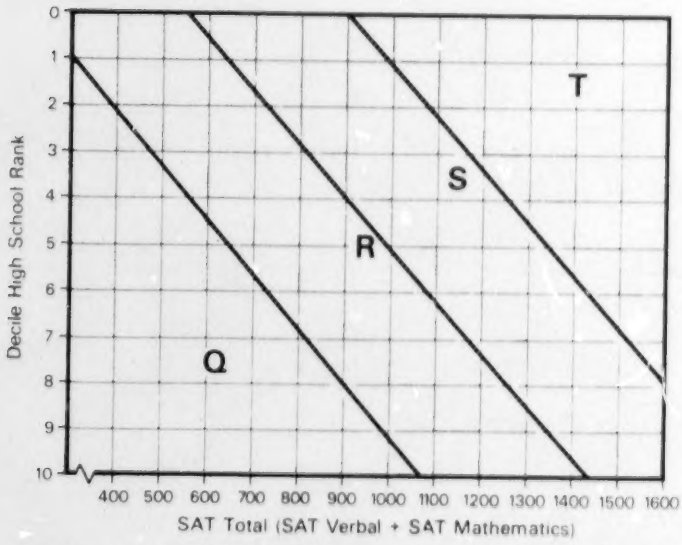

Figure 2. Predicted achievement categories for females.

Normative Data

Distributions of RHSR, SAT scores, and first semester grades (GPAs) are presented in Tables 4-8. The distributions are presented for males, females and for the total group. Advisors who wish to evaluate an individual's RHSR, SATV, SATM or SATSUM in relationship to entering freshmen on the Bloomington campus of Indiana University, can do so by referring to the appropriate normative group in Tables 4-7. Table 8 provides information on the GPAs obtained by entering freshmen in Fall Semester 1980. The data in Table 8 may be used to interpret GPAs and predicted GPAs.

Table 4

Normative Data on the Relative High School Rank of Entering Freshmen at Indiana University-Bloomington in Fall Semester 1980

Relative High School Rank	Decile High School Rank	MALES N of Cases in Category	MALES % Below Category	FEMALES N of Cases in Category	FEMALES % Below Category	TOTAL N of Cases in Category	TOTAL % Below Category
0- 5	1	201	90	372	84	573	87
6- 10		201	79	366	68	567	73
11- 15	2	174	70	275	57	449	63
16- 20		205	59	227	47	432	53
21- 25	3	168	51	212	38	380	44
26- 30		182	41	210	29	392	34
31- 35	4	150	33	186	21	336	27
36- 40		155	25	129	15	284	20
41- 45	5	130	19	131	10	261	14
46- 50		88	14	95	6	183	9
51- 55	6	87	10	60	3	147	6
56- 60		56	7	30	2	86	4
61- 65	7	46	4	13	1	59	3
66- 70		35	2	16	1	51	1
71- 75	8	14	2	5	-	19	1
76- 80		13	1	3	-	16	1
81- 85	9	6	1	4	-	10	-
86- 90		7	-	1	-	8	-
91- 95	10	4	-	1	-	5	-
96-100		2	-	0	-	2	-
NUMBER		1924		2336		4260	
MEAN		28		22		25	
MEDIAN		26		19		22	
STANDARD DEVIATION		19		16		18	

Table 5

Normative Data on the Scholastic Aptitude Test-Verbal Scores of Entering Freshmen at Indiana University-Bloomington in Fall Semester 1980

Scores	MALES N of Cases in Category	MALES % Below Category	FEMALES N of Cases in Category	FEMALES % Below Category	TOTAL N of Cases in Category	TOTAL % Below Category
781-800	0	-	0	-	0	-
761-780	0	-	1	-	1	-
741-760	1	-	3	-	4	-
721-740	2	-	3	-	5	-
701-720	5	-	5	99	10	-
681-700	4	99	18	99	22	99
661-680	15	99	27	98	42	98
641-660	22	97	19	97	41	97
621-640	34	96	38	95	72	95
601-620	40	93	49	93	89	93
581-600	55	91	70	90	125	90
561-580	60	87	80	87	140	87
541-560	96	82	112	82	208	82
521-540	109	77	123	76	232	76
501-520	113	71	124	71	237	71
481-500	151	63	155	64	306	64
461-480	167	54	178	57	345	55
441-460	194	43	214	47	408	46
421-440	137	36	197	39	334	38
401-420	159	28	223	29	382	29
381-400	170	19	185	21	355	20
361-380	107	13	125	16	232	15
341-360	92	8	124	11	216	10
321-340	62	5	68	8	130	7
301-320	43	3	77	4	120	4
281-300	18	2	42	3	60	2
261-280	16	1	32	1	48	1
241-260	7	1	9	1	16	1
221-240	5	-	7	1	12	-
201-220	4	-	10	-	14	-
200	2	-	2	-	4	-
NUMBER	1890		2320*		4210*	
MEAN	462		457		459	
MEDIAN	459		451		456	
STANDARD DEVIATION	88		95		92	

*One case was eliminated in this summary because the score was outside the possible range of the SAT.

Table 6

Normative Data on the Scholastic Aptitude Test-Mathematics Scores of Entering Freshmen at Indiana University-Bloomington in Fall Semester 1980

Scores	MALES		FEMALES		TOTAL	
	N of Cases in Category	% Below Category	N of Cases in Category	% Below Category	N of Cases in Category	% Below Category
781-800	0	-	0	-	0	-
761-780	5	-	1	-	6	-
741-760	5	99	5	-	10	-
721-740	12	99	5	-	17	99
701-720	16	98	15	99	31	98
681-700	41	96	11	98	52	97
661-680	42	94	24	97	66	96
641-660	78	89	41	96	119	93
621-640	99	84	56	93	155	89
601-620	100	79	81	90	181	85
581-600	113	73	91	86	204	80
561-580	149	65	128	80	277	73
541-560	137	58	131	75	268	67
521-540	146	50	162	68	308	60
501-520	162	42	162	61	324	52
481-500	139	34	165	54	304	45
461-480	113	28	174	46	287	38
441-460	143	21	202	37	345	30
421-440	81	16	176	30	257	24
401-420	79	12	150	23	229	18
381-400	72	8	147	17	219	13
361-380	54	6	137	11	191	9
341-360	31	4	88	7	119	6
321-340	37	2	66	4	103	3
301-320	19	1	50	2	69	2
281-300	11	-	27	1	38	1
261-280	4	-	19	-	23	-
241-260	1	-	4	-	5	-
221-240	1	-	2	-	3	-
201-220	0	-	1	-	1	-
200	0	-	0	-	0	-
NUMBER	1890		2321		4211	
MEAN	524		480		500	
MEDIAN	525		476		499	
STANDARD DEVIATION	96		95		98	

Table 7

Normative Data on the Scholastic Aptitude Test-Total Scores of Entering Freshmen at Indiana University-Bloomington in Fall Semester 1980

Scores	MALES N of Cases in Category	MALES % Below Category	FEMALES N of Cases in Category	FEMALES % Below Category	TOTAL N of Cases in Category	TOTAL % Below Category
1561-1600	0	-	0	-	0	-
1521-1560	0	-	0	-	0	-
1481-1520	0	-	1	-	1	-
1441-1480	1	-	1	-	2	-
1401-1440	5	-	4	-	9	-
1361-1400	11	99	9	99	20	99
1321-1360	13	98	13	99	26	99
1281-1320	27	97	23	98	50	97
1241-1280	31	95	37	96	68	96
1201-1240	74	91	61	94	135	93
1161-1200	104	86	80	90	184	88
1121-1160	116	80	101	86	217	83
1081-1120	144	72	145	80	289	76
1041-1080	176	63	125	74	301	69
1001-1040	148	55	181	66	329	61
961-1000	173	46	196	58	369	53
921- 960	182	37	208	49	390	43
881- 920	175	27	217	40	392	34
841- 880	131	20	206	31	337	26
801- 840	108	15	192	22	300	19
761- 800	102	9	161	16	263	13
721- 760	69	6	121	10	190	8
681- 720	47	3	102	6	149	5
641- 680	26	2	69	3	95	2
601- 640	15	1	27	2	42	1
561- 600	5	1	24	1	29	1
521- 560	3	1	12	-	15	-
481- 520	3	-	2	-	5	-
441- 480	1	-	2	-	3	-
401- 440	0	-	1	-	1	-
NUMBER	1890		2321		4211	
MEAN	985		938		959	
MEDIAN	985		930		954	
STANDARD DEVIATION	161		169		167	

Table 8

Normative Data on the First Semester Grades
of Entering Freshmen at Indiana University-Bloomington
in Fall Semester 1980

GPA	MALES N of Cases in Category	MALES % Below Category	FEMALES N of Cases in Category	FEMALES % Below Category	TOTAL N of Cases in Category	TOTAL % Below Category
4.00	29	99	39	98	68	98
3.90-3.99	28	97	41	97	69	97
3.80-3.89	40	95	63	94	103	95
3.70-3.79	72	92	66	91	138	92
3.60-3.69	69	88	82	88	151	88
3.50-3.59	53	86	101	84	154	85
3.40-3.49	65	82	86	81	151	81
3.30-3.39	67	79	98	77	165	78
3.20-3.29	84	75	122	72	206	73
3.10-3.19	96	70	134	66	230	68
3.00-3.09	132	64	166	59	298	61
2.90-2.99	106	58	134	54	240	56
2.80-2.89	108	53	144	48	252	50
2.70-2.79	123	47	159	41	282	44
2.60-2.69	108	42	117	37	225	39
2.50-2.59	96	37	126	32	222	34
2.40-2.49	85	33	107	27	192	30
2.30-2.39	82	29	94	23	176	26
2.20-2.29	79	25	96	19	175	22
2.10-2.19	84	21	72	17	156	18
2.00-2.09	72	17	83	13	155	15
1.90-1.99	48	15	51	11	99	13
1.80-1.89	43	13	44	9	87	11
1.70-1.79	37	11	40	8	77	9
1.60-1.69	31	9	25	7	56	8
1.50-1.59	28	8	30	5	58	6
1.40-1.49	17	7	19	5	36	6
1.30-1.39	24	6	20	4	44	5
1.20-1.29	19	5	15	3	34	4
1.10-1.19	10	4	12	3	22	3
1.00-1.09	16	4	7	2	23	3
.01- .99	52	1	37	1	89	1
0	20	-	22	-	42	-
NUMBER	2023		2452		4475	
MEAN	2.66		2.76		2.71	
MEDIAN	2.74		2.84		2.79	
STANDARD DEVIATION	.79		.74		.76	

Table 9

Indiana University and National Norms (1980) on the Scholastic Aptitude Test

Test	Indiana University Entering Freshmen		National College Bound	
	FEMALES	MALES	FEMALES	MALES
SAT-VERBAL	457 (95)*	462 (88)	420	428
SAT-MATH	480 (95)	524 (96)	443	491

*Standard deviations in parentheses.

Summary and Discussion

The primary purpose of the present monograph is to provide an update in the series of studies by the Bureau of Evaluative Studies and Testing on the prediction of Fall Semester GPAs. The sample for the present study consisted of 4,260 freshmen who entered the Bloomington campus of Indiana University in the Fall of 1980. SAT scores and/or relative high school rank (RHSR) are used to predict first semester GPAs. Three sets of equations for predicting GPAs are provided in Table 1. In terms of academic achievement, females were slightly more predictable than the males. The difference in predictability is reflected in the standard error of estimate (Sest) in Table 1 and the multiple correlations in Table 2. The most important single predictor of GPA for males and for females is RHSR.

An alternative procedure for evaluating the probable success of a student at I. U. during his/her first semester is provided in the section entitled Graphs for Predicting Grade Point Averages. By using Figure 1 or Figure 2 and the information provided in Table 3, an advisor may estimate the probabilities of a student obtaining GPAs in various ranges.

In addition to providing prediction schemes, the present monograph includes local normative data on SATV, SATM, SATSUM, RHSR, and first semester GPA. For the 1980 entering freshmen, males and females were equal on SATV, but the males averaged 45 points higher than females on SATM. The average entering female ranked 6 percent higher in her high school graduation class and obtained a higher first semester GPA than the average entering male.